CLAIMS:

1. A distributed-feedback semiconductor laser comprising an active region for generating the gain of a laser beam and a diffraction grating formed in said active region, wherein

the front end surface out of the front and back end surfaces between which said active region is interposed has a reflectivity of 1 percent or less, the back end surface out of said two end surfaces has a reflectivity of 30 percent or more when viewed from the back end surface side toward the front,

the coupling coefficient κ of said diffraction grating is 100 cm^{-1} or more, the length L of said active region is 150 μ m or less, and

a combination of κ and L so that these parameters provide $\Delta \alpha / g_{th}$ of 1 or more, where $\Delta \alpha$ is the gain difference between modes and g_{th} is a threshold gain.

2. The distributed-feedback semiconductor laser as defined in claim 1 wherein the product of said coupling coefficient κ and said active region length L is at least 1 and not more 3.

3. The distributed-feedback semiconductor laser as defined in claim 1 or 2 wherein the active region length L is not longer than Lp where Lp is the length of the active region provided that the dependency of $\Delta \alpha / g_{th}$ on the active region length L is plotted and $\Delta \alpha / g_{th}$ is on a peak in value.

4. The distributed-feedback semiconductor laser as defined in any one of claims 1 to 3 wherein said diffraction grating is a gain coupled structure or loss coupled structure, or

has a structure in which two or three out of the gain coupled, loss coupled, and refractive index coupled structures are mixed, or

is of a structure that is refractive index coupled and $\lambda/4$ shifted.

5. The distributed-feedback semiconductor laser as defined in any one of claims 1 to 3 wherein said diffraction grating has a structure that is refractive index coupled and $\lambda/4$ shifted, and the $\lambda/4$ shift position is at a distance backward from the front end of said active region by 75 percent $\pm$ 5 percent where the longitudinal direction length of said active region is 100 percent.

6. The distributed-feedback semiconductor laser as defined in any one of claims 1 to 5 wherein the back end surface of said active region is formed by etching, and the longitudinal direction length of the entire device including the distributed-feedback semiconductor laser is longer than 150 μ m.

7. The distributed-feedback semiconductor laser as defined in claim 6 wherein said device is so structured to include another function region integrated behind the distributed-feedback semiconductor laser through an end surface gap formed by said etching process.

8. The distributed-feedback semiconductor laser as defined in claim 7 wherein said other function region has a light-receiving function.

9. The distributed-feedback semiconductor laser as defined in claim 8 wherein the front end surface of said other function region is formed tilted relative to the back end surface of said active region.

10. The distributed-feedback semiconductor laser as defined in any

one of claims 7 to 9 wherein said other function region has a reflection function to said active region.

11. The distributed-feedback semiconductor laser as defined in any one of claims 1 to 10 wherein the reflectivity of the back end surface of said active region is set to 90 percent or more.

12. The distributed-feedback semiconductor laser as defined in claim 11 wherein the reflectivity of the back end surface of said active region is set to 90 percent or more by providing a high-reflection film on said back end surface.

13. The distributed-feedback semiconductor laser as defined in claim 12 wherein a window that guides light out from said active region is formed on said high-reflection film.

14. The distributed-feedback semiconductor laser as defined in any one of claims 1 to 13 wherein materials that constitute said active region comprise at lease one selected from the group of A1, N and Sb.

15. The distributed-feedback semiconductor laser as defined in any one of claims 1 to 14 wherein the distributed-feedback semiconductor laser has a series resistance of 50 ohms $\pm$ 10 ohms.

16. A distributed-feedback semiconductor laser array monolithically comprising an array of the distributed-feedback semiconductor lasers as defined in any one of claims 1 to 15 wherein the distributed-feedback semiconductor lasers have different wavelengths from one another.

17. An optical module that comprises the distributed-feedback semiconductor laser as defined in any one of claims 1 to 15 or the distributed-feedback semiconductor laser array as defined in claim 16.

18. A distributed-feedback semiconductor laser, wherein

the laser has an extremely short active region not longer than a predetermined length,

a diffraction grating is provided in said active region,

an indicator for single-mode stability is $\Delta \alpha / g_{th}$ (where $\Delta \alpha$ is the gain difference between modes, g_{th} is a threshold gain which is the sum of internal loss α_i and mirror loss α_m), $\Delta \alpha / g_{th}$ is set to a value not less than a value corresponding to the fact that, in order to oscillate, an auxiliary mode requires a gain obtained by multiplying a gain that a main mode requires to oscillate by a predetermined number, and single-mode stability is provided.

19. The distributed-feedback semiconductor laser as defined in claim 18 wherein the reflectivity of the front end surface out of the front and back end surfaces between which said active region is interposed is set to a value not more than a first value, which is a relatively low value, and the reflectivity of the back end surface when viewed from the back end surface side toward the front side is set to a value not less than a second value, which is a relatively high value.

20. The distributed-feedback semiconductor laser as defined in claim 18 wherein the coupling coefficient of said diffraction grating is not less than a predetermined value, and

a combination of the coupling coefficient of said diffraction grating and the length of said active region is used, provided that a value of said single-mode stability indicator $\Delta \alpha / g_{th}$ is not less than a value indicating that an auxiliary mode requires a gain twice as much

as a main mode to oscillate.

21. A distributed-feedback semiconductor laser wherein an external reflector is provided behind the distributed-feedback semiconductor laser as defined in claim 1 or 18.

22. A distributed-feedback semiconductor laser comprising an active region for generating the gain of a laser beam and a diffraction grating formed in said active region wherein an external reflector is provided behind said active region.